UDC 622.24.084

SYSTEM CONTROL PARAMETERS OF DRILLING

M.A. Nosaev

National Research Tomsk Polytechnic University
Institute of Non-destructive testing
Tomsk, Russia
E-mail: maksim_nosaev@mail.ru

The article analyzes control system of drilling parameters.Describes a list of basic monitored parameters.Use of indirect calculations is proposed to reduce the number of these parameters.

System "Leuza-2" is intended for measurement and control of technological parameters of drilling, operational control, optimization and ensuring safety of oil and gas wells drilling.

The system provides: current information automatic gathering, processing,includingderivative parameters calculation, representation using display and registration devices (drilling operator console); documenting of drilling results in a digital, analogue and graphic forms. Also exceeding of technological parameters beyond determined limits is controlled, in case of exceeding of parameters beyond the limitslight and acoustic alarms are turned on. Such technological solutions as circuit design with spark-safe electrical circuits, filing blocks with high pressure air and sensors with explosion-proof covers are applied in the system.

Basic components ofdrilling parameters technological control system "Leuza-2" are:

- block ACPS (amplifying, commutating and power supply) receiving analogue and impulse signals of sensors, transforming it in a digital code and exchanging data with a computer and a drilling operator console;
- drilling operator console displaying technological information and system control panel;
- set of sensors.

Sensors are installed on the drilling unit,function in a continuous mode and serve for reception of the primary information about condition of technological parameters. In the given system following controllable parameters are basic:

- number of turns of a draw work shaft (headway),
- hook load,
- a twisting moment on a rotor,
- quantity of pump throws,
- densityof drill fluid,
- levelof drill fluid,
- pressureof drill fluid,
- flow rate of drill fluid.

It is offered to replace indrill fluid supply system two sensors (pressure and level) used in the well head with one hydrostatic level sensor, which measures both of these parameters.

Operation principle of hydrostatic pressure sensor is following: when pressure of the process influences the sensor, the dividing membrane is moved, transferring measured pressure through filling liquid, to asensitive membrane. This pressure causes change of position of a sensitive membrane in a sensor control cell, changing capacity between a membrane and condenser plates.

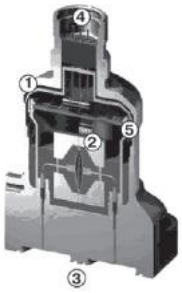

Fig. 1. The General view of the primary converter: 1 - a case, 2 - a capacitor cell, 3 - sensitive dividing membranes, 4 - a plug socket, 5 - an electric board

The value of hydrostatic pressurePg depends on height of a column of a liquid h over the measuring device and from density of this liquid ρ.

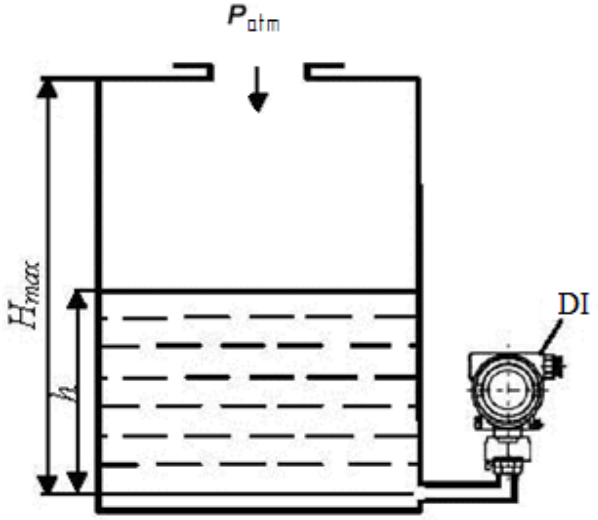

Fig. 2. An arrangement of the pressure sensoron the tank: DI – differential instrument

Then the value of drill fluid pressure will be equal to:

$$Pg = \rho g h,$$

where ρ - drill fluid density, g=9,81 m/s2 - acceleration of free falling, h - height of a measured liquid.

Having expressed from this expression h, we receive required drill fluid level:

$$h = \frac{Pg}{g\rho}$$

Knowing value of hydrostatic pressure, it is possible to receive the information on drill fluid level in thetank.

REFERENCES

1. Булатов А.И. Контроль процессов бурения нефтяных и газовых скважин / А.И. Булатов, В.И. Демихов, П.П. Макаренко. – М.: Недра, 1998.
2. Лугуманов М.Г. Система удаленного контроля и управления процессом строительства скважин / М.Г. Лугуманов, А.Б. Гусев, Д.В. Артемов // Научно-технический вестник "Каротажник" – 2005. – № 5–6. http://npfgeofizika.ru/leuza/science/article20.htm.

Authors' information:
Nosaev M.A.: Tomsk, National research Tomsk polytechnic university, Institute of Non-destructive testing, e-mail: maksim_nosaev@mail.ru